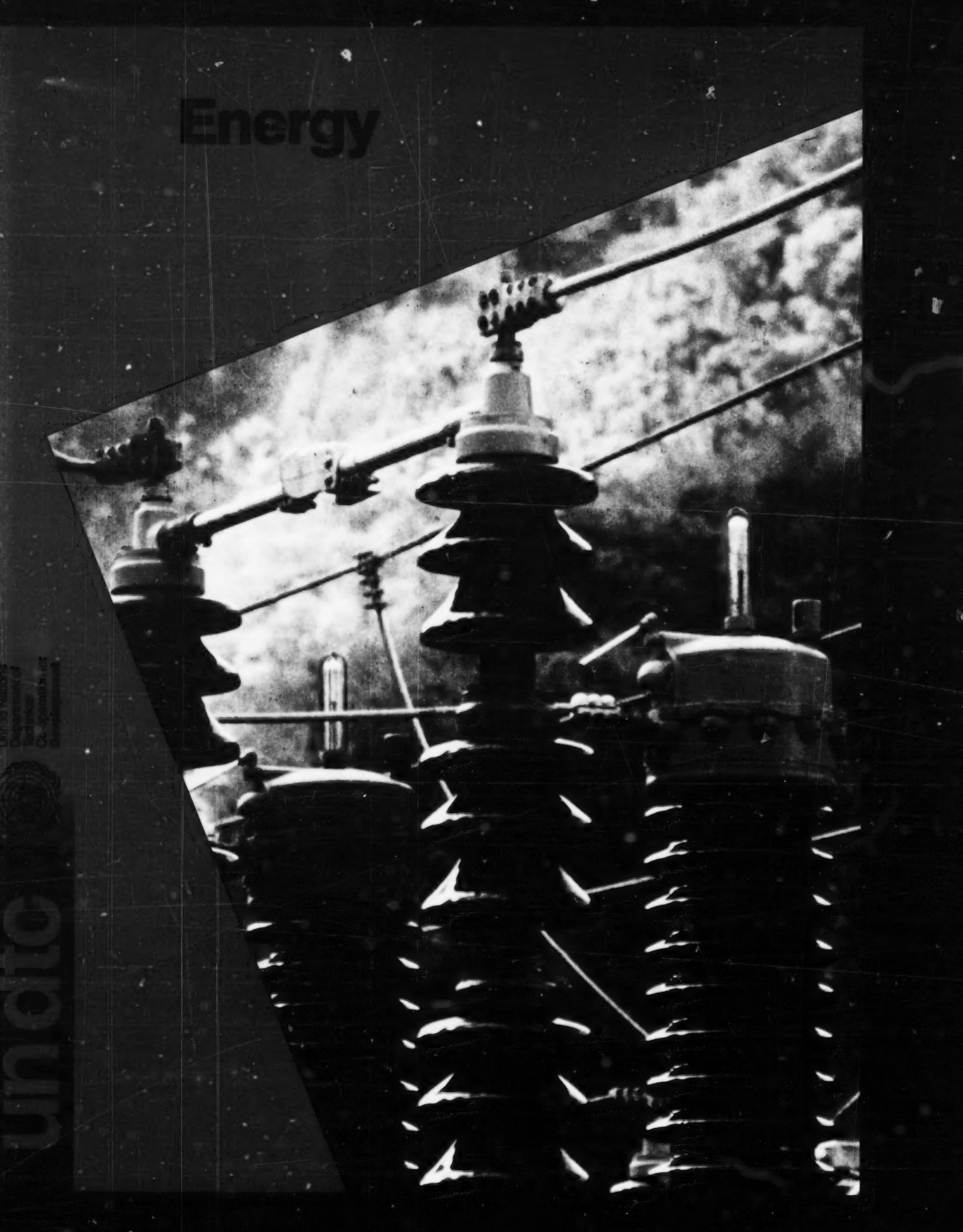
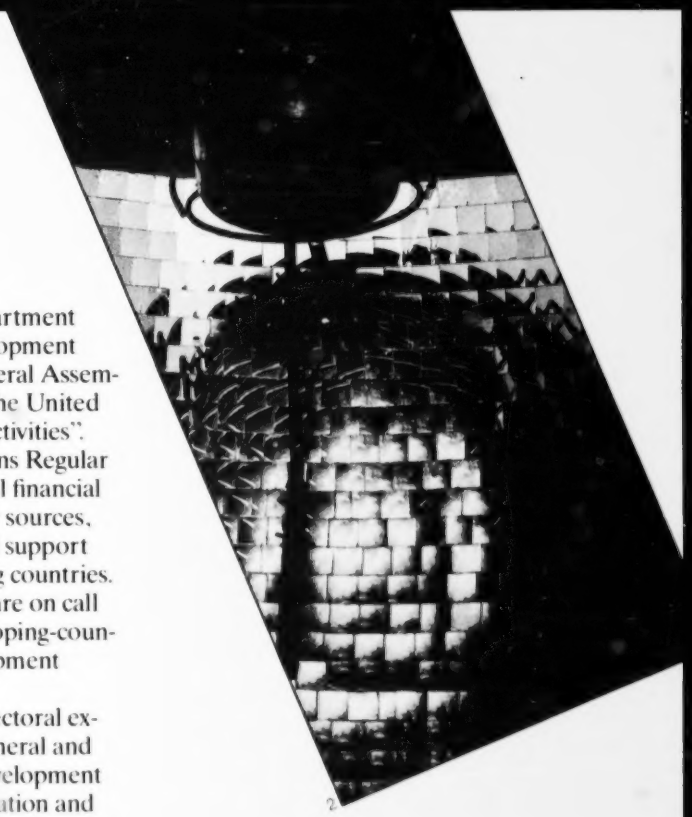
Energy



undtcd



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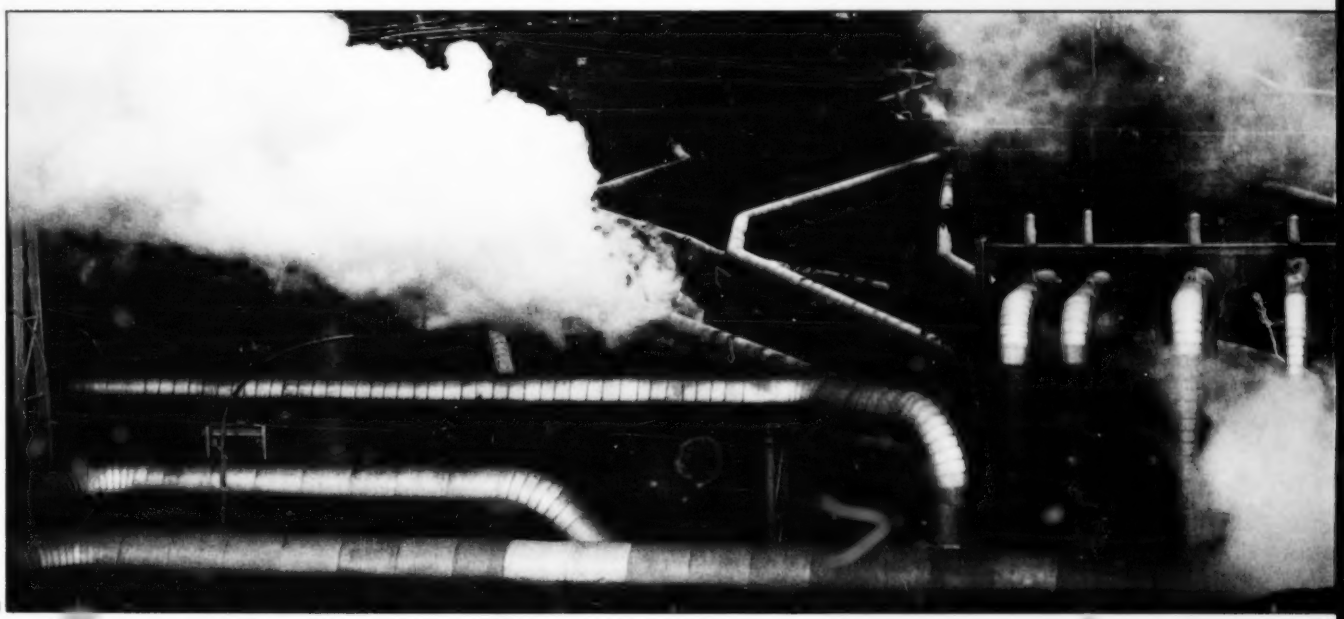
1 The geothermal power plant in Ahuachapan, El Salvador was built as a result of one of the earliest UNDTCD projects in this field, undertaken about 20 years ago.

2 Solar cooker in Lanzhou, Gansu Province of China. 100,000 of these cookers, many of them from the DTCD-assisted Gansu Natural Energy Research Institute, have been sold in remote sunny areas of China. In good sunlight they can boil a pot of water in a few minutes, and they are said to be popular with people who make their living selling tea by the roadside.

The United Nations Department of Technical Co-operation for Development **undtcd** was established by the General Assembly in 1978 as the "principal arm of the United Nations for technical co-operation activities". With funding from the United Nations Regular Budget, UNDP, UNFPA, multilateral financial institutions, Governments and other sources, **undtcd** currently provides technical support to nearly 1,000 projects in developing countries. In addition, its specialized advisors are on call to make expertise available to developing-country Governments for specific development problems.

The Department's multi-sectoral expertise covers the fields of water, mineral and energy resources, infrastructure, development planning, statistics, public administration and finance, population and social development. A key goal of **undtcd** is to help developing countries achieve self-reliance in all these areas.

This brochure outlines **undtcd**'s work in the field of energy.



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Energy and Development

3 Biogas digester under construction at the training centre at Chengdu, Sichuan Province of China. Five million such digesters are in use by farm families in China and another 1.2 million in India. They provide a sanitary method of converting animal (and human) wastes to a gas which can be used for cooking and lighting. The remaining slurry retains the fertilizer value of the original.

The availability of adequate energy supplies is indispensable for the growth of industry, agriculture, transport, communications and public utilities and services; and it is a prime contributor to the "quality of life" in the household sector. Energy costs significantly determine the ability of developing countries to finance their economic growth and meet urgent human needs. The ways in which energy is produced, distributed and utilized have profound effects on the environment and public health.

In many parts of the developing world, a wealth of energy resources could support large production increments. There are many road-blocks to realizing these possibilities. Exploiting energy reserves will require major capital investments and these will be difficult to come by with energy-importing debt servicing costs creating a net capital outflow of some $50 billion a year, and oil import bills running at $30 billion annually. Energy-efficient technologies that can minimize the increased consumption on which development progress depends are also costly and, since over half the population lives in rural areas, they are difficult to deploy. Air and water pollution, soil degradation, and the accelerating greenhouse effect of both energy production and utilization pose formidable constraints.

undtcd provides the services of its interregional advisers or technical advisers free of charge to developing countries requesting short-term advisory missions of up to three weeks. These experts, highly qualified and experienced in all major aspects of energy development (oil, coal, gas, electric power, energy policy and planning, conservation, geothermal, solar, wind and energy information systems), provide advice on energy policy, resource evaluation and exploration, design of projects and feasibility studies.

With total current budgets of some $130 million for work in this field, **undtcd** helps developing countries through projects and short-term advisory services with:

- Exploration and development of oil, gas, coal and geothermal reserves together with potentials for hydropower, solar, wind and biomass energy generation.
- Energy planning and information systems.
- Development of national energy policy and conservation programmes.
- Strengthening energy-related institutions and legislation.
- Promotion of modern energy technologies and rehabilitation and upgrading of power networks.
- Broad-spectrum training courses, seminars, and workshops for managers, engineers and technicians.

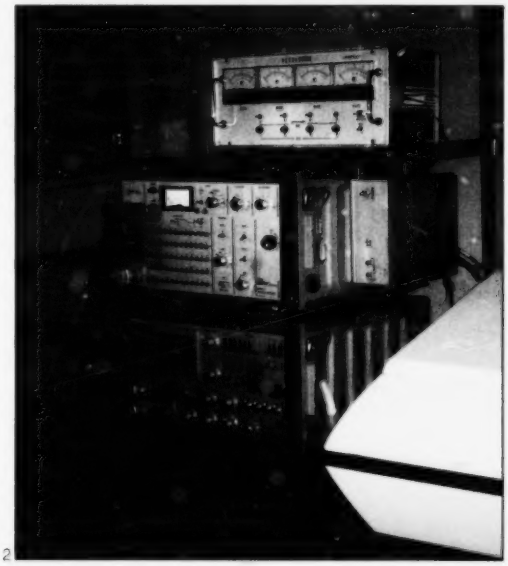
From Potential to Productivity

A prime focus of undtcd's technical co-operation in energy is to help make developing country resources accessible and available on a sustained basis. The largest single component of this work, about 37 per cent, is devoted to the exploitation of fossil fuels.

1 With UNDTCD assistance, computerized systems to monitor mine-machinery performance are being developed for use in open-cast coal mines such as this one in Czechoslovakia.

2 View of the instrumentation room on board the ship which conducted a marine engineering geological survey of 55,000 km² in the Pearl River Mouth Basin of China.

3 A geothermal energy project in Laguna Colorado, Bolivia has drilled four successful deep exploration wells which are producing sufficient geothermal fluids to operate a 5 MW back-pressure turbine that the Government is installing.



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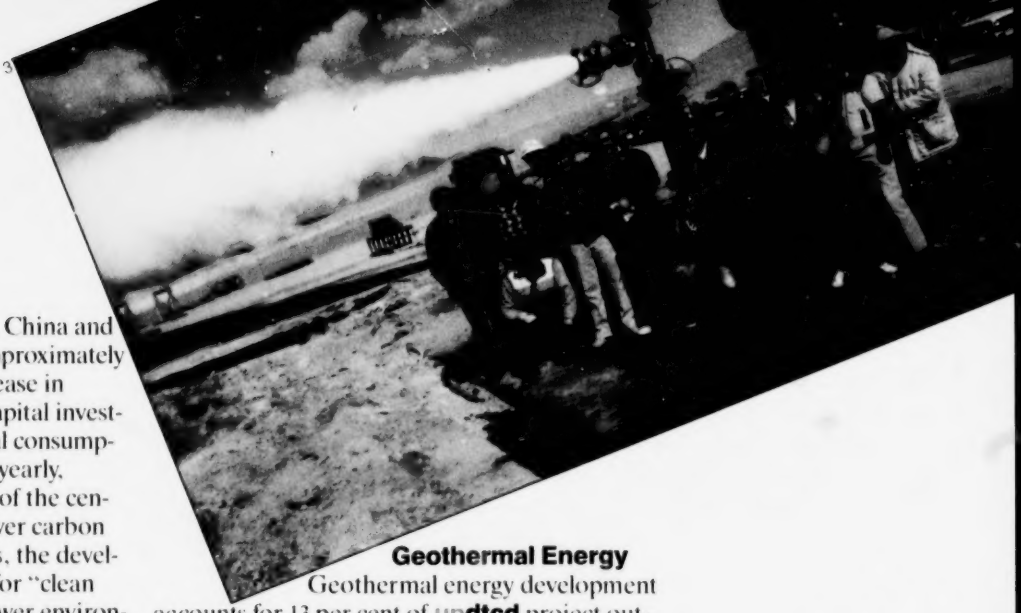
Oil and Gas

In the developing world as a whole, oil is by far the most important energy source. Consumption grew by over 23 per cent during the 1980s and is projected to nearly double during the next ten years. Natural gas usage is more than keeping pace, with an average 7 per cent yearly growth rate and economically viable supplies identified in more than 50 developing countries.

To help increase energy self-sufficiency, undtcd is working with developing countries to locate oil and gas deposits and assess their value, to mobilize development capital and to upgrade technical skills, decision-making machinery, negotiation techniques, capabilities for financial and economic analysis and legislative and organizational structures.

In China's Southern Guizhou Province, four large modern vibrators and a digital recording laboratory, with national staff trained in advanced geophysical prospecting, have produced over 1,000 line kilometres of seismic profiles identifying several promising leads to subsurface oil deposits. Meanwhile, falling output from over 100 wells in the Shengli oil fields has been restored through the problem-solving services of the Sand Control Institute.

undtcd's investment advisory services have helped the Government of Peru to conclude a $106.5 million contract for oil and natural gas exploration with the Mobil Oil Corporation. In addition to assisting with contract negotiations, project staff helped to formulate an improved legal framework for regulating foreign energy investments and a medium term strategy for petroleum and natural gas development.



Coal

The developing countries, China and India in particular, accounted for approximately 40 per cent of the past decade's increase in world coal usage. Given adequate capital investment and other incentives, their coal consumption, now growing nearly 4 per cent yearly, could outstrip that of oil by the end of the century. Because of serious concerns over carbon dioxide and sulfur dioxide emissions, the developing countries have special needs for "clean coal" technologies which not only lower environmental risks but raise fuel utilization efficiency.

undtcd technical co-operation is introducing updated coal mining processes in developing countries, mine planning and design, automation, mechanization, computerization and improved coal processing.

India is working with **undtcd** to increase coal output and lower production costs under the guidance of an effective environmental programme. Assistance includes managing coal mine water systems; developing related computer software models and testing them against real-life conditions; working out strata, subsidence and other ground-control techniques, introducing hydrofracturing for hard-coal extraction and tightening safety measures. The environmental impact of large-scale coal mining is being pin-pointed and both preventive and remedial measures are being introduced.

A four-year World Bank-funded project has enabled Colombia's state coal company, CARBOCOL, to prepare new policies that will not only promote increased investments but ensure maximum benefits in terms of taxes, participation income, technology transfers and domestic business development. A major project achievement is a $600 million investment by a United States coal company which could lead to a ten million ton yearly increase in production.

Geothermal Energy

Geothermal energy development accounts for 13 per cent of **undtcd** project outlays. The Energy Branch has a pioneering record in this field that dates back to the 1960s, and geothermal power plants are operational in several developing countries as a result of its assistance. Project services include provision of expertise for geoscientific surveys, exploratory drilling for feasibility studies and reservoir engineering and management.

Four deep geothermal wells have been drilled in Bolivia's remote rural area of Laguna Colorado, with yields sufficient to operate a 5MW demonstration plant that will provide industrial, commercial and household power and permit exploitation of mineral deposits in this very-low-income region. Funding from the Government of Italy and UNDP has underwritten an expansion of project activities. They include provision of energy services to locate well sites; carrying out geochemical and geophysical well-logging; definition of the geothermal reservoir's physical characteristics; powerplant design; acquisition of a drilling rig and scientific instrumentation, and overseas training for national power professionals.

1 Mongolian herding family with portable 40 W solar photovoltaic (PV) battery charger in the background. Their home is in the Gobi desert of the People's Republic of Mongolia. These devices for directly converting sunlight to electricity are the best hope for meeting the need for lighting and broadcast reception for hundreds of millions of families in remote areas of the world.

Solar and Wind Energy

Geography and climate have endowed many developing countries with a treasure trove of renewable energy resources, in particular, high levels of solar radiation and favourable wind régimes. The 11 per cent of **undtcd** project expenditures committed to capitalizing on these advantages support a variety of economically attractive solar and wind applications.

The People's Republic of Mongolia is the site of a spectrum of successful experiments of renewable energy technologies. Indicative of the prospects is conclusion of the country's first-ever licensing agreement with a U.K. company to manufacture small wind generators as portable power sources for nomadic herdsmen. The next phase of this project focuses on production of photovoltaic generators that convert sunlight directly into electricity.

The total wind energy resources of the island nation of Mauritius are being inventoried and assessed under a project to evaluate potentials for supplying wind-generated electricity to the existing power distribution network.

Electricity

Over the past 20 years, developing-country electric power demand has grown 7 per cent annually and is expected to increase two and a half times during the 1990s, with capital investment requirements exceeding $800 billion. **undtcd**'s technical co-operation in electric-power production is the second largest field of the Department's energy activities, accounting for 27 per cent of project expenditures.

undtcd assistance stresses planning, training, and plant maintenance and upgrading. Projects place strong emphasis on the efficient operation of large integrated power networks, including utility management and operation, distribution engineering and commercial electricity supply. Simultaneously, major attention is being given to developing small-scale hydropower facilities that can supply electricity to isolated rural communities whose needs have hitherto been met by costly, oil-fuelled generating plants.

After recent international seminars highlighted the urgency of power-plant rehabilitation, **undtcd** launched a global modernization initiative to increase both output and operating reliability and encourage fuel conversion. Proposals for participating in this programme are being discussed with 33 developing countries which have expressed interest.

Egypt's long-term electricity planning is being facilitated by the establishment of computerized information systems to collect, process and disseminate data and provide the necessary hardware and software. Computerized models are being developed for updating and extending transmission and distribution networks.

In Ethiopia, the $13.9 million Sor River hydropower project has resulted in installation of a 5MW-capacity generating plant and a transmission and distribution network.

On the Strategic Front

1 An advisory mission to Kampuchea examined the electricity distribution system and recommended a step-by-step programme of modernization and efficiency measures.

2 UNDTCD is stepping up efforts to provide developing country energy planners with state-of-the-art software packages such as those used for training purposes at the UN/OLADE training centre.

3 Crane raising a 100 kW wind turbine. This is to power an ice machine for a fishing village on the Red Sea coast of Egypt. A similar turbine was installed to provide power for the electric grid in another DTCD project in Mauritius. Thousands of such turbines are providing grid power in "wind farms" in Denmark and California.

The World Resources Institute estimates that, if historical trends continue, per capita commercial energy demand in the developing world will quadruple by the year 2020. But they also project that the application of energy-efficient technologies could reduce this increase to only about 20 per cent while allowing developing countries to raise living standards to modern European levels.

undtcd efforts to help expand energy output march hand-in-hand with vigorous measures for conservation, improved productivity of power-generating facilities, reduction of losses in transport and distribution, increased efficiency of end-usage and the development of energy-sector environmental strategies.

To make optimal use of available energy resources, the Department is helping Governments enhance their national energy planning and energy information systems, formulate energy policies, carry out comprehensive energy-resource surveys, and analyse energy-resource development and utilization practices. Energy planning departments are being strengthened through staff training, the introduction of computer modelling packages and the upgrading of computer facilities. Other projects address energy conservation needs across the board, from large-scale manufacturing facilities to rural households.

An interregional training centre for energy planners has been inaugurated in co-operation with the Latin American Energy Organization (OLADE). At the centre, participants from Asia, Africa and Latin America are being equipped to employ a variety of computer programmes for energy planning.

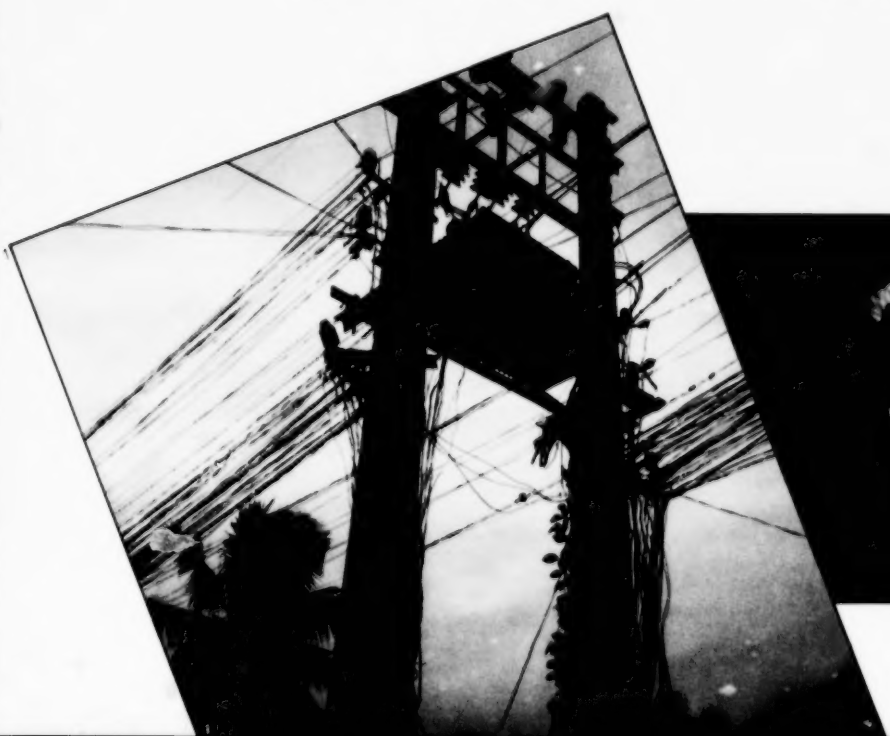
India, Peru and Zambia are being helped to conduct energy audits as part of national energy conservation programmes. Energy savings of 25 to 35 per cent are typical at audited enterprises.

How to obtain our services

Governments may obtain our technical co-operation and advisory services in the energy field by writing to:

Chief, Energy Branch
Natural Resources and Energy Division
United Nations Department
of Technical Co-operation
for Development
One United Nations Plaza
New York, New York 10017, USA
FAX (212) 963-4340

or by contacting the UNDP Resident Representative in their country, who is also the representative of **undtcd.**



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